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ABSTRACT

While university researchers have long made use of the complex research-oriented applications of the computer and have discussed its utilization in the instructional process, in the early stages of computer use in higher education, two-year colleges made little or no use of its advanced research capabilities, and limited its use to business and record-keeping functions. At all levels of higher education, eight traditional problems have been associated with computer use; these include issues of ownership and administrative control, types of appropriate hardware and suitable functions, access, and financial support. Since its establishment in 1963, Cuyahoga Community College has followed the traditional pattern of computer use and has encountered these and other problems in developing its computer resources. Frustrations resulted from use of outdated equipment with limited capabilities. Since 1975, a concerted effort has been made to evaluate computing needs at Cuyahoga and to upgrade systems and equipment accordingly. Specific actions taken to meet the identified needs included internal studies, needs assessment surveys, comparative institutional study, and contracting with an independent technical resource firm. Current accomplishments and a description of the present status of computer use at Cuyahoga are included in the report. (DR)

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HARNESSING THE COMPUTER POTENTIAL: TRADITIONAL PROBLEMS--PROFESSIONAL MANAGEMENT--GOVERNANCE

by

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1. Infancy of the Computer

Computers passed out of the realm of science fiction and into use for esoteric scientific applications in the late 1940's and early 1950's. They became a work horse for the business accounting functions of the nation's larger organizations—both profit and nonprofit—in the mid- and late 1950's. A genuine potential for more sophisticated planning, operational, control, and management information applications was partially realized in the late 1960's and 1970's; this was a potential, however, that—if the truth were told—was less often exploited than fantasized about. Only in the present decade has the average person, in his capacity as a private citizen and consumer, begun to encounter the computer in any significant way.

2. Patterns in Higher Education

In the early 1950's, university researchers, with federal grants, were developing complex research-oriented applications. We think of analyses in the realm of nuclear physics, of support to space satellites, and of massive sociopsychological correlation studies of social behavior; we spoke of "research-oriented computers". By the latter part of the 50's, the more innovative and risk-taking financial officers at the larger and better-financed colleges and universities had moved the basic general accounting and paycheck-writing functions from punch-card-driven unit record equipment to what we called "administrative computers". Academic-instructional applications in general support of the teaching process were, however, still almost unknown.

By the beginning of the 1960's, the larger, federally funded, research-oriented universities were irrevocably committed both (1) to massive specialized computer resources under the control of the academics and (2) to administrative--which meant mainly business office and student records—hardware as well. However, visitors

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to most other colleges of any real size found one of the key questions arising regarding the computer resource to be that of ownership: who was to control the limited institutional resources that could be devoted to the computer? The contending forces were generally focused in the provost or graduate dean on the one hand and the chief business officer on the other; occasionally that dilemma was rejected in favor of a new subcabinet-level office for computers reporting directly to the president or chancellor. The question seemed critical to many, since the answer chosen appeared to have a major influence on the capabilities of the hardware procured, on the interests of the staff working in the center, and on the priorities established for access to the resource. Of importance here was that during the 50's and 60's, the hardware tended to be designed by the vendors either for business applications or for weighty research; few cost-efficient in-between-type main frames were available on the market.

During this period, little attention on the campuses was given to the question of broad utilization in the instructional process—though much was written about the subject. Only specially trained administrators and staff researchers had any real hope of putting these new machines to work for them. Neither the typical faculty member nor student—nor administrative staffer—had much chance to benefit from the new technology. The cost factor was always present, but the more important considerations included lack of flexibility of the equipment; lack of training of most faculty members, students, and administrators; lack of interest and experience on the part of computer center staff; and lack of software support. As a footnote, drill-and-practice programs were being developed for such applications as remedial instruction in math and English; however, these were little more than the simplest of teaching machines and enjoyed little more than experimental applications here and there.

I've been depicting the scene in American higher education generally. The two-year colleges had little or no use for the advanced research capabilities of the huge scientific instruments; they did, however, have somewhat more interest in experimentation with teaching-machine and tutorial approaches. In two-year colleges, ownership was most generally with the business office—which could justify the expenditure for the relatively simple, work-horse software and hardware required to perform business ledger and payroll calculations, print paychecks and perform limited student record computations.

3. Traditional Problems in Higher Education

What, over the period of this brief and admittedly superficial retrospective, have been the problems traditionally encountered in utilization of the computer resource in higher education? I'll list eight in what is admittedly only a partial enumeration:

- First is the question: who is to be directly served? Possible groups comprise the research-oriented faculty, the teaching faculty, the students, the college's business administrators, the college's records, admissions, and student affairs officers, and the college's general administrative staff.

- Second is the closely related question: who is to control the hardware—and thus determine type of mainframe and software and establish priorities in program development and routine operation?

- Third is the closely related question: how many centers: one for both academic and administrative use—or one for each—or even more?

- Fourth is the also closely related question: is the hardware to be mainly chosen for its capacity to serve the business/financial and student administrators, or the faculty and students, or some combination of part or all of these potential user groups?

- Fifth is the question: is the institution to construct a single integrated, computer-assisted information and control data base and system or several such data bases and systems?

- Sixth is the question: Who is to input information into the data files? May decentralized administrators update college data files directly or must they pass along their inputs in the form of written-down figures, punched cards, or tapes for inputting in a batch mode after verification steps?

- Seventh is the question: who is to have access? This and the previous question raise the specters of costly and sometimes irreversible contamination of the files and of manipulation of data for unauthorized purposes, as well as of rights to privacy of individuals.

- Eighth, given a desire to upgrade computer capabilities, is the question: is this effort to be undertaken with existing college resources or with outside help also—and, if the latter, how extensive?

These problems and issues may not constitute an all-inclusive list. However, they are faced by <u>all</u> colleges bent on harnessing the computer to the work of the institution.

4. <u>Computing Developments At CCC—Applications</u>

The computer had already moved from the stage of crawling to that of taking a few tentative steps when Cuyahoga Community College opened its doors in 1963. The college, nevertheless, followed in the footsteps of other higher education institutions already described.

With no upper division and graduate studies and no major research effort at CCC, the only significant protagonists of the computer in the college's early days were the business shop and the student

records officers. Moreover, the college, in its first years, was a one-campus institution, and when the two added campuses were opened, it was initially on a small scale. So the first uses of the computer were for student records and general accounting—over the period 1963 to about 1970.

As time passed, the computer facility continued to service the college's centralized accounting and student records. In addition, the hardware was pressed increasingly into tasks of administrative record keeping and generation of reports, the latter mainly for external agencies concerned with college funding and student financial aid. Perhaps because the very first application was for student records, the college's computer center--the hardware most recently a Honeywell 2015--reported until a couple of years ago to the chief academic officer and was located as a part of the district headquarters organization.

An institution as large as ours was becoming in the early 1970's—11,000 or so full-time equivalent students, 21,000 headcount in any quarter, and 40,000 or so a year in total—was certain ultimately to find some other interests raised and realized. So with the articulation of a data processing curriculum designed to prepare students for service in the computer production shops of local businesses and industries, the question of equipment to support this pedagogical process emerged and was resolved—most currently in the form of captive IBM 360/20's at two campuses. These were machines the students could see, touch, feed work to, and pull output from in a symbiotic relationship. Among Cuyahoga Community College's 350-400 or so full-time and 500-600 part-time faculty were also a few who had the training, interest, and initiative to seek to supplement their traditional instructional programs with specialized computer resources—PDP/8's and Nova 4's, hookups to external hardware facilities, and the like.

5. Computing Developments At CCC--Frustrations

But by the early 1970's, a feeling of discontent vis-a-vis the college's computer resources had begun to be evidenced.

- The Honeywell 2015 ran reasonably well as an accounting and paycheck producing, and student records, machine—to the limits of its restricted software programming. However, it could produce little in the line of management-type reports by department or program or project.

- In the area of general administrative use, there were few analytical, recording and reporting programs; the lack of an integrated data base made development of any new such program a horrendous task. No effective college capability

existed for computer-assisted simulation programs to take the manual labor out of such repetitive but important tasks as long-range financial forecasting and enrollment projecting.

- In the academic area, the two campus-based IBM 360 Model 20's--though part of a line that is by now 15 years old—fairly well met the needs of the data processing faculty and students. But no capability existed for computer assistance in the instructional processes except for the little pools of resources acquired for the few computer-oriented activities gotten underway by some faculty members.

- In the computer center itself, the hardware was old, limited in its capabilities, inflexible, and not capable of supporting modern state-of-the-art administrative applications and interactive faculty and student utilization. And the staff—composed of dedicated and hardworking people—was not equipped to undertake the developmental, processing, and applications work desired by the college's users.

To recapitulate: in its simplest terms, the discontent that I spoke of was being generated by the gap, increasingly perceived throughout the college community, between what was becoming accepted as the promise of the computer and its reality at CCC; this reality, I might add somewhat defensively, differed little from what was to be found in recent years at most other large two-year college campuses.

6. Computing Developments At CCC--Responses To Frustrations

The college responsed by beginning to address the situation positively. Through the early 1970's, meetings of concerned college people were called and study papers were written. By 1975, a year after the arrival of the present Chancellor, this led to a commitment to undertake a major upgrade in computer-assisted systems support to college administrative processes. Several decisions were made:

- First, to purchase a single central processor focusing on service to administrative users.

- Second, to purchase a student information system package.

- Third, to adapt that package, and to generate other software, mainly through the efforts of the college's own, existing computer center staff.

- Fourth, to accept that this course of action would require perhaps as many as six years of supporting effort by the college computer center's programming section in order to bring off the entire planned upgrade, and

- Fifth, to fit these improvements into the college's long-range institutional development and financial plans.

Little more than lip service, in the planning and actions taken at that time, was given to service to the college's academic/instructional community.

In late 1975, RFP's were issued for both hardware and software. Responses were received and were being evaluated in early 1976 when it was decided to abort the venture for three major reasons. First was an as-yet-unresolved concern as to the advisability of solving college needs within a larger, college-and-university consortium in the Cleveland area. Second was the recognition of the sizable expenditures--and risks--involved. Third was the lack of confidence--not in the goodness or competence per se of anyone--but in the effective capability of the existing organization structure, executive function, and staff to pull off the job.

The next year was devoted to attempts to strengthen the resources that would be needed for implementation. Before the task was considered completed, however, internal pressure of groups--whose expectations had been raised by the momentum of the year before--grew too great to be withstood for some positive commitment to improved hardware, software, and computer-assisted service to the institution.

More or less as a holding action, the college responded by issuing a new RFP in early 1977, this time for hardware only. The specifications were for a far more restricted capability than had been sought 18 months before. Symbolic of the classic issues of service and control, the invitation to bid was now for two mainframes. The first, to be located centrally, was for administrative applications. The second, to be located on a campus, was for academic utilization.

The RFP's came in and were evaluated for decision at a regular monthly board meeting. A decision was also to be made at this same meeting on the employment of a new chief financial and administrative officer to be charged with college executive-team responsibility for bringing off whatever would be done in this general area of upgraded computer-assisted systems. The board faced a dilemma. Proceeding with the selection of hardware could effectively relieve the new officer of subsequent responsibility for the consequences of that decision. However, involving him in determining, afresh, how to proceed--and thus being able later to hold him responsible for results in this important area--would once again delay the decision on proceeding.

7. Computing Developments At CCC--1977 Decisions

With firm college executive and board resolve, CCC once again held up the choice among hardware vendors--and then aborted, for a second time in 15 months, the entire computer procurement process. Executive commitment to leadership requirements continued to be the controlling concern.

I'd like now to capsulize what we have done at CCC since May, 1977, to deal with the kinds of problems I have been discussing.

- First, we carefully evaluated our needs once again. We reviewed all the internal studies and recommendations--and experiences--of the past five years. We conducted new surveys of needs as perceived by our administrators and faculty. More important in my estimation, we approached a dozen or so other large two-year colleges to determine what actual pattern of utilization, particularly in the academic/instructional area, they had experienced when they had added new capabilities.

- Second, we decided on principle that the Cuyahoga Community College District is of sufficient size and complexity and possesses sufficient resources that it both should, and is able to, be in the vanguard of American colleges in the employment of the computer as a tool to assist it in its academic programs and its administrative support activities. We thus rejected the approach adopted in the second RFP of temporizing--of attempting too little too late.

- Third, we placed line leadership of the total effort on the college's chief financial and management services officer. Then we constituted a cabinet-level body composed of the college's senior educators to advise this directly responsible vice chancellor on all aspects of the computer-assisted systems upgrade effort.

- Fourth, we satisfied ourselves that one powerful interactive, time-sharing central computing setup with a broad spectrum of peripherals--OPSCAN, remote job entry units, video tube terminals, printers--could meet <u>all</u> of the needs of <u>both</u> the instructional program <u>and</u> the administration without sacrifice to either. By choosing this course, we would save on hardware, space, air conditioning, and the like, and--more precious than any of these--scarce suppliers of talented technical managers and staff.

- Fifth, we committed ourselves to the concept of a single, integrated data base and system rather than to developing several data bases and systems. This, we knew, would require better initial planning and ongoing project coordination, but would, we were sure, pay off in the future.

- Sixth, we committed ourselves to giving top priority to use of the computer to enhance our educational programs where a near vacuum had existed in computer applications. In doing this, we knew that on the administrative side we were at least limping along and could continue to do so for an indefinite period.

- Seventh, we easily reacned the decision that we couldn't do all of this alone--or even by employing limited external resources to plug up isolated resource gaps. So we chose to go outside to contract with a single technical resource firm to help us with selection of hardware, with systems and software development, and with facilities management and operation. This would also mean that we could hold one organization responsible for the entire ball of technical and operational wax--rather than face the probability that at key points a college center staff and the outside consultants would be throwing verbal stones at one another.

- Eighth, this meant that we soon decided to ask our own computer center employees to join the staff of the outside consulting firm. That firm made it easy by offering a total employment package at least equal to ours. Some of our staff, of course, moved to other positions or dropped out along the way, and, after a few months, the outside firm terminated a few poor performers--where we formerly were finding it difficult to determine quality of performance and harder to do anything about it.

- Ninth, we set up advisory committees of District and campus administrators and faculty to assist in, and sign off on, systems and software development--for the student information system, for academic/instructional support, and for financial management systems. Each of these District-wide committees created task forces on subcomponents of the systems in their areas. Then they all went to work.

8. Computing Developments At CCC--Accomplishments To Date

We have been active in this approach for a year and a half to two years. Where do we stand now, in the spring of 1979?

- First, with the help of our technical consultants, we have selected, installed, and rendered operational two Honeywell 66/10's, about the equivalent of a single Honeywell 66/20, an IBM 370/155, or a Univac 90/60. We believe negotiations by our consultants saved us several hundred thousand dollars on the purchase of the mainframes. Moreover, in the week or so prior to signing the contract, our consultants learned that Honeywell was about to announce a new line of computers providing given capacities for much lower costs. So we negotiated an option, subsequently exercised, for upgrade this spring to a Honeywell DPS 1, a machine with capabilities two and a half times that of the new 66/10's--at an incremental cost for the entire package of only some 12 percent over the purchase price of the 66/10's.

- Second, about 81 remote terminals--video tubes, printers, remote job entry units, OPSCANs--are now operational on the three campuses and in the District Office.

- Third, every one of our 1,050 full- and part-time teachers and 24,000 students are now able to walk into well-equipped terminal service centers on their campuses and, with help from computer center academic/instructional technicians, utilize a powerful computer capability to accomplish any purpose they are capable of achieving--with essentially no resource limitations.

- Fourth, we are, and will continue to be providing training programs at the several sites to ensure that potential users do have the requisite skills to actually utilize this resource.

- Fifth, reprogramming of the old Honeywell 2015 programs to the new Honeywell 66/10s is now being completed and the older hardware will soon be removed.

- Sixth, the programming has been completed for a completely new, state-of-the-art, on-line student information system. Implementation is coming up for the summer quarter just ahead--delayed from last winter's quarter only because of delays by vendors in meeting delivery contract commitments.

- Seventh, consistent with the first priority given academic/instructional users and the second priority given the student information system, the financial management system is getting off the ground with a new general ledger account structure and system to be brought up in July 1979, with purchasing, receivables, budget, payroll/personnel, and other financial management systems modules scheduled for the remainder of the coming fiscal year. This new FMS system will be based on a new transaction code, with a potential for up to 21 digits, that will permit aggregation of data and reporting not only by campus, but also by subordinate organization levels, by NCHEMS categories, by intercampus program categories, and by project.

- Eighth, the computer center is making headway, as time and resources permit, against an impressive list of new, specialized requirements to support particular administrative needs.

9. Computing Developments at CCC--Present Status

Do we have problems? You bet we do. Let me list three.

- First, we are having problems maintaining schedules originally laid down. On the other hand, substantially everything will work well. However, we were fully aware that in the area of computer-assisted systems upgrades, few things do. Principal scheduling problem areas include:

  - Hardware procurement, where the central processors were on schedule but, as a result of vendor delays, the peripherals were not,

- college contributions to systems development, where our ability to provide our share of the conceptual and technical inputs has lagged due to demands of other priorities on our time and difficulty in generating desired levels of creativity, and

- external consultant contributions to systems and software development, where a generally excellent picture still reflects greater strengths and more rapid progress in some areas than others.

- Second, a few months ago we were experiencing a rash of problems. This we diagnosed as the result of changing horses midstream. We had been depending on a smaller group of employees who, while not beginning to be able to meet CCC's needs of the 1980's, had learned to do a number of routine things well, though with deteriorating tape control systems and informal and often undocumented procedures. Now we are looking to a larger staff of mostly new employees who initially lacked the local site experience, and had not been left the needed formal, documented procedures, required to process inputs to outputs on established schedules.

- Third, we have been finding it necessary to keep a firm hand on our campus and District Office remote terminal equipment expenditures. It seems that everyone believes he or she needs his/her own personal terminal for a usage not yet demonstrated in practice. Good planning and firm control are proving the solution to this one.

But we are now moving in a most dramatic way. First results have already been seen on the campuses in support to faculty and students. Next will be support to student registration processes, classroom assignments, and faculty workload accounting processes. Coming in third will be general administrative processes. Along the way we are providing special programmatic and problem-solving support to administrators as priorities and resources make such software development projects feasible.

We expect to see our cost for a number of our data-related activities drop, for example, in specific records and admissions operations, accounting operations, and planning and forecasting studies. And we expect to improve vastly both the data available to us and our ability to utilize them so as to reach better decisions on programs and on resource allocations and utilization.

We know that the net of reducing costs for specific data processing activities and of expanding our service and output means that in the 1980's we'll experience a level of computer-related expenditures well above those of recent years. But we are confident of a level of service to the institution that will vastly exceed anything we were remotely able to achieve before we set out on our present course.

10. Computing Developments At CCC--Key Factors

I'd like to close my remarks by drawing attention to five factors that have been absolutely key to this whole development.

- First, the fundamental course of action on which we are embarked is clearly identified in and flows from our college's revised charter and Official Plan.

- Second, we have had the meaningful commitment and support of our top leadership--our board, chancellor, and cabinet-level group.

- Third, we have resolutely placed responsibility on one senior official, providing him with the advice of a cabinet group, and have given him commensurate authority to move ahead.

- Fourth, we have entered this whole project with our eyes open as to the costs, timing, and problems involved. At least we believe, and experience to date supports, that we have been forewarned of the major sand traps in our course.

- Fifth, we have attempted to avoid the disappointments and disillusionments that could be caused throughout the system by building expectations that are prematurely too high.

The College is now on the way to achieving a position in the forefront of computer usage in American colleges and universities of our general type. The constituencies we serve should be the beneficiaries.

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